Question 19

Correct

Mark 1.00 out of 1.00

Flag question

In empirical risk minimization the predictor is:

Select one:

a. None of the above.

b. A probabilistic function.

c. A deterministic function.

Question 20

Correct

Mark 1.00 out of 1.00

Flag question

The regression matrix A of the data (x_i, y_i), $i = 1, \ldots, N$, $x_i, y_i \in \mathbb{R}$, for a polynomial model of degree $k-1$, has elements:

Select one:

a. $a_{i,j} = x_i^{j+1}, i = 1, \ldots, N, j = 1, \ldots, k.$

b. $a_{i,j} = x_i^{j-1}, i = 1, \ldots, N, j = 1, \ldots, k.$

c. $a_{i,j} = x_i^{j}, i = 1, \ldots, N, j = 1, \ldots, k.$

Question 21

Question 17

Correct

Mark 1.00 out of 1.00

Flag question

If X, Y are random variables with values in $\mathbb{R}^D$, then:

Select one:

a. $Cov(X, Y)$ is a matrix $D \times D$.

b. $Cov(X, Y)$ is a scalar.

c. $Cov(X, Y)$ is a vector $D \times 1$.

Question 18

Correct

Mark 1.00 out of 1.00

Flag question

Given two random variables X and Y. Bayes Theorem implies that $p(y|x) = \frac{p(x|y)p(y)}{p(x)}$ where:

Select one:

a. $p(x|y)$ is called posterior distribution on y

b. $p(x|y)$ is called prior distribution on x

c. $p(x|y)$ is called likelihood on y

Question 19

In empirical risk minimization the predictor is

Type here to search

Question 20

Correct

Mark 1.00 out of 1.00

Flag question

The regression matrix A of the data $(x_i, y_i), i = 1, \ldots, N, x_i, y_i \in \mathbb{R}$, for a polynomial model of degree $k-1$, has elem

Select one:

a. $a_{i,j} = x_i^{j+1}, i = 1, \ldots, N, j = 1, \ldots, k.$

b. $a_{i,j} = x_i^{j-1}, i = 1, \ldots, N, j = 1, \ldots, k.$

c. $a_{i,j} = x_i^{j}, i = 1, \ldots, N, j = 1, \ldots, k.$

Question 21

Correct

Mark 1.00 out of 1.00

Flag question

If U is an $n \times n$ orthogonal matrix, $x \in \mathbb{R}^n$, then:

Select one:

a. None of the above.

b. $\|Ux\| > \|x\|.$

c. $\|Ux\| < \|x\|.$

d. None of the above.

Question 15
Correct
Mark 1.00 out of 1.00
Flag question

For a random variable $X : \Omega \to \mathcal{T}$, its variance is defined as:

Select one:

a. $Var(X) = \mathbb{E}[(X - \mathbb{E}[X])^2]$.

b. $Var(X) = \mathbb{E}[X - \mathbb{E}[X]]$.

c. $Var(X) = \mathbb{E}[X^2 - \mathbb{E}[X]^2]$.

Question 16
Correct
Mark 1.00 out of 1.00
Flag question

Given a discrete random variable $X : \Omega \to \mathcal{T}$, with $\mathcal{T} = \{1, 2, 3\}$ and $f_X = \{\frac{1}{6}, \frac{1}{3}, \frac{1}{2}\}$ its PMF, then:

Select one:

a. $\mathbb{E}[X] = 2$.

b. $\mathbb{E}[X] = \frac{14}{6}$.

c. $\mathbb{E}[X] = 6$.

Question 17

https://virtuale.unibo.it/mod/quiz/review.php?attempt=3048109&cmid=1475382#question-3084222-14

Dashboard

Question 7
Correct
Mark 1.00 out of 1.00
Flag question

If $A = U\Sigma V^T$ is the SVD decomposition of an $m \times n$ matrix A, then:

Select one:

a. None of the above

b. The rows of V^T are eigenvectors of $A^T A$.

c. The columns of U are eigenvectors of $A^T A$.

Question 8
Correct
Mark 1.00 out of 1.00
Flag question

The solution of $\min_x ||Ax - b||_2^2$ where A is an $m \times n$ matrix, $m \geq n$, $rank(A) = n$, can be computed as:

Select one:

a. $AA^T x = A^T b$.

b. $A^T Ax = A^T b$.

c. $A^T Ax = b$.

Question 9
Correct
Mark 1.00 out of 1.00

If $f : \mathbb{R}^3 \to \mathbb{R}$, $f(x_1, x_2, x_3) = \sin x_1 - \sin x_2 \cos x_3 + x_3^2$, then $\nabla f(0, \pi, \pi)$ equals to:

Select one:

Dashboard

Question 13

Incorrect

Mark 0.00 out of 1.00

Flag question

If $f : \mathbb{R}^n \to \mathbb{R}$, $f \in C^1(\mathbb{R}^n)$, then the Gradient Descent method $x_{k+1} = x_k - \alpha_k \nabla f(x_k)$ converges to a stationary point of f if:

Select one:

a. $\alpha_k \to 0$ as $k \to \infty$.

b. $\alpha_k > 0 \; \forall k \in \mathbb{N}$.

c. $\alpha_k > 0$ is chosen with a backtracking procedure.

Question 14

Incorrect

Mark 0.00 out of 1.00

Flag question

If $\mathcal{A}$ is the event space and $\mathcal{T}$ is a subset of $\mathbb{R}$, then:

Select one:

a. $\forall A \in \mathcal{A}$, $X(A)$ is the probability that X lies in A.

b. None of the above.

c. $\forall A \in \mathcal{A}$, $X(A)$ is the event "X lies in A".

Question 15

Correct

Mark 1.00 out of 1.00

For a random variable $X : \Omega \to \mathcal{T}$, its variance is defined as:

Select one:

Dashboard

Question 5

Correct

Mark 1.00 out of 1.00

Flag question

If V is a vector space, $U \subseteq V$ is a subspace, and $\Pi_U : V \to U$ is a projection. Then:

Select one:

a. $\Pi_U(x) \notin U, \forall x \in V.$

b. None of the above.

c. $\Pi_U(x) = 0, \forall x \in V.$

Question 6

Incorrect

Mark 0.00 out of 1.00

Flag question

If

$$A = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 4 \end{bmatrix}$$

then:

Select one:

a. $K_2(A) = 4.$

b. $K_2(A) = 2.$

c. $K_2(A) = \frac{1}{2}.$

Type here to search

https://virtuale.unibo.it/mod/quiz/review.php?attempt=3048109&cmid=1475382#question-3084222-14

Dashboard

Question 9

Correct

Mark 1.00 out of 1.00

Flag question

If $f : \mathbb{R}^3 \to \mathbb{R}$, $f(x_1, x_2, x_3) = \sin x_1 - \sin x_2 \cos x_3 + x_3^2$, then $\nabla f(0, \pi, \pi)$ equals to:

Select one:

a. None of the above.

b. $(-1, 0, \pi)$.

c. $(0, 0, 0)$.

Question 10

Correct

Mark 1.00 out of 1.00

Flag question

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = x_1 x_2$, $g : \mathbb{R} \to \mathbb{R}^2$, $g(t) = (t, t^2)$ then, if $h(t) = f(g(t))$,

Select one:

a. $h'(t) = 3t^2 + 1$.

b. $h'(t) = 3t^2 - 1$.

c. None of the above.

Question 11

Correct

Mark 1.00 out of 1.00

If $f : \mathbb{R}^n \to \mathbb{R}$. Which of the following statements is False?

Select one:

Question 3
Incorrect
Mark 0.00 out of 1.00
Flag question

If $A \in \mathbb{R}^{n \times n}$ is symmetric and positive definite, then:

Select one:

a. None of the above.

b. $A_{i,j} \geq 0$ for all i, j.

c. All the eigenvalues λ_i of A are ≥ 0.

Question 4
Incorrect
Mark 0.00 out of 1.00
Flag question

If U is an $n \times n$ orthogonal matrix, then:

Select one:

a. The rows of U are orthogonal vectors.

b. None of the above.

c. The rows of U are orthonormal vectors.

Question 5
Correct
Mark 1.00 out

If V is a vector space, $U \subseteq V$ is a subspace, and $\Pi_U : V \to U$ is a projection. Then:

Select one

m: January 8th: Attempt revie

https://virtuale.unibo.it/mod/quiz/review.php?attempt=3048109&cmid=1475382#question-3084222-14

Virtuale Dashboard

Question 1

Incorrect

Mark 0.00 out of 1.00

Flag question

If $x = 0.7 \cdot 10^{-4}$ and $y = 1.7892$, which is the value of $z = x + y$ when represented in $\mathcal{F}(10, 5, -5, 5)$?

Select one:

a. None of the above.

b. $0.17892 \cdot 10^1$

c. $0.17899 \cdot 10^1$

Question 2

Incorrect

Mark 0.00 out of 1.00

Flag question

The 1-norm of a vector x of size n is defined as:

Select one:

a. $||x||_1 = \sum_{i=1}^{n} |x_i|$

b. None of the above.

c. $||x||_1 = \max_i |x_i|$

Question 3

Incorrect

If $A \in \mathbb{R}^{n \times n}$ is symmetric and positive definite, then:

Dashboard

Question 11

Correct

Mark 1.00 out of 1.00

Flag question

If $f:\mathbb{R}^n \to \mathbb{R}$. Which of the following statements is False?

Select one:

a. x^* local minimum for $f \implies \nabla f(x^*) = 0$.

b. $\nabla f(x^*) = 0 \implies x^*$ stationary point for f.

c. $\nabla f(x^*) = 0 \implies x^*$ local minimum for f.

Question 12

Correct

Mark 1.00 out of 1.00

Flag question

Let $f:\mathbb{R}^2 \to \mathbb{R}$, $f(x_1,x_2) = 9x_1x_2^2 - x_1$, $\nabla f(x_1,x_2) = (9x_2^2 - 1, 18x_1x_2)$ then which of the following is a stationary point for f?

Select one:

a. $(0,0)$.

b. None of the above.

c. $(0,3)$.

Question 13

Incorrect

Mark 0.00 out of 1.00

If $f:\mathbb{R}^n \to \mathbb{R}$, $f \in C^1(\mathbb{R}^n)$, then the Gradient Descent method $x_{k+1} = x_k - \alpha_k \nabla f(x_k)$ converges to a stationary point of f if:

Select one:

[redacted]

Domanda 11
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^n \to \mathbb{R}$, then:

Scegli un'alternativa:

a. x^* local minimum for $f \iff \nabla f(x^*) = 0$.
b. $\nabla f(x^*) = 0 \implies x^*$ local minimum for f.
c. x^* local minimum for $f \implies \nabla f(x^*) = 0$.

[redacted]

Domanda 12
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Let $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = 9x_1x_2^2 - x_1$, $\nabla f(x_1, x_2) = (9x_2^2 - 1, 18x_1x_2)$ then which of the following is a stationary point for f?

Scegli un'alternativa:

a. None of the above.
b. $(0, 0)$.
c. $(0, 3)$.

[redacted]

Domanda 13
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = x_1e^{x_2}$, then if the initial guess for a gradient descent iteration is $x^{(0)} = (1, 1)^T$ and $\alpha = \frac{1}{2}$, then:

Scegli un'alternativa:

a. $x^{(1)} = (1 - \frac{e}{2}, 1 - \frac{e}{2})^T$.
b. $x^{(1)} = (1 + \frac{e}{2}, 1 + \frac{e}{2})^T$.
c. $x^{(1)} = (\frac{1}{2} - \frac{e}{2}, \frac{1}{2} - \frac{e}{2})^T$.

[redacted]

Domanda 14
Risposta errata
Punteggio ottenuto 0,00 su 1,00
Contrassegna domanda

Given two random variables X and Y, then the posterior probability of X given Y is defined as:

Scegli un'alternativa:

a. $P(X = x, Y = y)$.
b. $P(Y = y|X)$.
c. $P(X = x|Y)$.

[redacted]

Domanda 15
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

For a random variable $X : \Omega \to \mathcal{T}$ with $\mathbb{E}[X] = 0$, it holds:

Scegli un'alternativa:

a. $Var(X) = \mathbb{E}[X^2]$.
b. $Var(X) = \mathbb{E}[X]$.
c. $Var(X) = 0$.

[redacted]

Domanda 16
Risposta

Given a discrete random variable $X : \Omega \to \mathcal{T}$, with $\mathcal{T} = \{0, 1\}$, and $f_X =$ [illegible], then:

Domanda 6
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

then:

Scegli un'alternativa:

a. $K_2(A) = \frac{1}{2}$.

b. $K_2(A) = 4$.

c. $K_2(A) = 1$.

[redacted]

Domanda 7
Risposta errata
Punteggio ottenuto 0,00 su 1,00
Contrassegna domanda

If $A \in \mathbb{R}^{m\times n}$, then:

Scegli un'alternativa:

a. It depends on A.

b. $A^T A$ is symmetric but not necessarly positive definite.

c. $A^T A$ is always symmetric and positive definite.

[redacted]

Domanda 8
Risposta errata
Punteggio ottenuto 0,00 su 1,00
Contrassegna domanda

A solution of $\min_x \|Ax - b\|_2^2$ where A is an $m \times n$ matrix, $m \geq n$, $rank(A) = k < n$, can be computed as:

Scegli un'alternativa:

a. $A^+ x = b$.

b. $AA^T x = A^T b$.

c. $x = A^+ b$.

[redacted]

Domanda 9
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = x_1^2 + x_1 x_2$, $g : \mathbb{R} \to \mathbb{R}^2$, $g(t) = (\cos(t), \sin(t))$, then, if $h(t) = f(g(t))$:

Scegli un'alternativa:

a. $h'(t) = \cos(2t) - 1$.

b. $h'(t) = 1 - \sin(2t)$.

c. $h'(t) = \cos(2t) - \sin(2t)$.

[redacted]

Domanda 10
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = x_1 + 2x_2^2$, $g : \mathbb{R} \to \mathbb{R}^2$, $g(t) = (t, t^2)$ then, if $h(t) = f(g(t))$,

Scegli un'alternativa:

a. $h'(t) = 8t^3 + 1$.

b. $h'(t) = t^3 + t$.

c. $h'(t) = 3t^3 + 1$.

[redacted]

Domanda 11

Domanda 16
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Given a discrete random variable $X : \Omega \to \mathcal{T}$, with $\mathcal{T} = \{0, 1\}$, and $f_X = \{\frac{2}{3}, \frac{1}{3}\}$, then:

Scegli un'alternativa:

a. $\mathbb{E}[X] = 1$.
b. $\mathbb{E}[X] = \frac{2}{3}$.
c. $\mathbb{E}[X] = \frac{1}{3}$.

[redacted]

Domanda 17
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If X, Y are multivariate random variables with states $x, y \in \mathbb{R}^D$, then:

Scegli un'alternativa:

a. $Cov(X, Y) = \mathbb{E}[X, Y^Y] - \mathbb{E}[X]$.
b. $Cov(X, Y) = \mathbb{E}[X, Y] + \mathbb{E}[X]\mathbb{E}[Y]$.
c. $Cov(X, Y) = Cov(Y, X)$.

[redacted]

Domanda 18
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Given two random variables X and Y, Bayes Theorem implies that $p(y|x) = \frac{p(x|y)p(y)}{p(x)}$ where:

Scegli un'alternativa:

a. $p(x|y)$ is called likelihood on y.
b. $p(x|y)$ is called prior distribution on x.
c. $p(x|y)$ is called posterior distribution on y.

[redacted]

Domanda 19
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Given two random variables X and Y such that $p(x) = ce^{-|x|}$ and $p(y|x) = \frac{1}{\sqrt{2\pi}}e^{-\frac{1}{2}(y-ax)^2}$, then the MLE reads:

Scegli un'alternativa:

a. $x^* = \arg\min_x \frac{1}{2}(y - ax)^2 + \frac{1}{2}x^2$.
b. $x^* = \arg\min_x \frac{1}{2}(y - ax)^2 + |x|$.
c. $x^* = \arg\min_x \frac{1}{2}(y - ax)^2$.

[redacted]

Domanda 20
Risposta non data
Punteggio max.: 1,00
Contrassegna domanda

Suppose a set of data $(x_i, y_i), i = 1, \dots, N$, $y_i = f(x_i) + \epsilon_i$, where $\epsilon_i \sim \mathcal{N}(0, \sigma^2)$. In linear regression, the likelihood function is:

Scegli un'alternativa:

a. $p(y|x, \theta) = \prod_{i=1}^N \mathcal{N}(x|x_i^T\theta, \sigma^2)$.
b. None of the above.
c. $p(y|x, \theta) = \prod_{i=1}^N \mathcal{N}(y|x_i^T\theta x_i, \sigma^2)$.

[redacted]

Domanda 21
Risposta errata
Punteggio ottenuto 0,00 su 1,00

A solution of $\min_x ||Ax - b||_2^2$ where A is an $m \times n$ matrix, $m \geq n$, $rank(A) = k < n$, can be computed as:

Scegli un'alternativa:

a. $x = A^+b$.

Valutazione 18,00 su un massimo di 21,00 (85,71%)

Domanda 1
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $x = 3.89167$ and $y = 0.4567$, which is the value of $z = x - y$ when represented in $\mathcal{F}(10, 5, -5, 5)$?

Scegli un'alternativa:

a. 3.434.
b. $0.3434 \cdot 10^0$.
c. 3.4343.

[redacted]

Domanda 2
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Given the matrix:

$$A = \begin{bmatrix} -4 & 0 \\ -1 & -2 \end{bmatrix}$$

Compute the 2-norm and the 1-norm of A:

Scegli un'alternativa:

a. None of the above.
b. $\|A\|_2 = 4, \|A\|_1 = \sqrt{5}$.
c. $\|A\|_2 = 6, \|A\|_1 = 5$.

[redacted]

Domanda 3
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Which pairs of vectors are linearly independent?

Scegli un'alternativa:

a. $(2, 1, 0), (-3, 4, 1)$.
b. $(0, 1, -1), (0, \frac{1}{7}, -\frac{1}{7})$.
c. $(\frac{1}{2}, \frac{1}{3}, 2), (1, \frac{2}{3}, 4)$.

[redacted]

Domanda 4
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $x = (\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}), y = (-\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}})$, then:

Scegli un'alternativa:

a. x and y are orthonormal.
b. x and y are orthogonal.
c. x and y are parallel.

[redacted]

Domanda 5
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If V is a vector space, $U \subseteq V$ is a subspace, and $\Pi_U : V \to U$ is a projection. Then:

Scegli un'alternativa:

a. None of the above.
b. $\Pi_U(x)$ is the point with minimum distance to x in U.
c. $\Pi_U(x)$ is the point with maximum distance to x in U.

[redacted]

Domanda 6
Risposta corretta
Punteggio ottenuto 1,00

If

$$A = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 3 & 0 & 0 \end{bmatrix}$$

Domanda 17
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If X, Y are multivariate random variables, then:

Scegli un'alternativa:

a. $Cov(X, Y) = -\mathbb{E}[X]\mathbb{E}[Y] + \mathbb{E}[X, Y]$.

b. None of the above.

c. $Cov(X, Y) = \mathbb{E}[X, Y] - \mathbb{E}[X]$.

[redacted]

Domanda 18
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Given two random variables X and Y, Bayes Theorem implies that:

Scegli un'alternativa:

a. $p(x) = \frac{p(y)p(y|x)}{p(y|x)}$.

b. $p(x) = \frac{p(x|y)p(y|x)}{p(y)}$.

c. $p(y) = \frac{p(y|x)p(x)}{p(x|y)}$.

[redacted]

Domanda 19
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Given two random variables X and Y such that $p(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}x^2}$ and $p(y|x) = ce^{-|y-ax|}$, then the MLE reads:

Scegli un'alternativa:

a. $x^* = \arg\min_x \frac{1}{2}(y - ax)^2$.

b. $x^* = \arg\min_x |y - ax| + x^2$.

c. $x^* = \arg\min_x |y - ax|$.

[redacted]

Domanda 20
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

The regression matrix A of the data $(x_i, y_i), i = 1, \dots, N, x_i, y_i \in \mathbb{R}$, for a polynomial model of degree $k - 1$, has shape:

Scegli un'alternativa:

a. $k \times N$.

b. $N \times N$.

c. $N \times k$.

[redacted]

Domanda 21
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $A \in \mathbb{R}^{n \times n}$ is symmetric and positive definite, then:

Scegli un'alternativa:

a. All the eigenvalues λ_i of A are ≥ 0.

b. $A_{i,j} \geq 0$ for all i, j.

c. None of the above.

[redacted]

Fine revisione

Domanda 11
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^n \to \mathbb{R}$, $x^* \in \mathbb{R}^n$ is a strictly local minimum for f if:

Scegli un'alternativa:

a. $\exists \epsilon > 0$ s.t. $f(x^*) \leq f(x), \forall x \in \mathbb{R}^n, \|x - x^*\| < \epsilon$.

b. $f(x^*) \leq f(x), \forall x \in \mathbb{R}^n$.

c. None of the above.

[redacted]

Domanda 12
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^3 \to \mathbb{R}$, $f(x_1, x_2, x_3) = 2x_2 + x_1x_3 - 3x_1x_2$, $\nabla f(x_1, x_2, x_3) = (x_3 - 3x_2, 2 - 3x_1, x_1)$ then which of the following statements is True?

Scegli un'alternativa:

a. The gradient of f is equal to zero at multiple points.

b. The gradient of f is never equal to zero.

c. $(0, 0, 0)$ is a stationary point for f.

[redacted]

Domanda 13
Risposta errata
Punteggio ottenuto 0,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^n \to \mathbb{R}$, $f \in C^1(\mathbb{R}^n)$, then the Gradient Descent method $x_{k+1} = x_k - \alpha_k \nabla f(x_k)$ converges to a stationary point of f if:

Scegli un'alternativa:

a. $\alpha_k > 0 \; \forall k \in \mathbb{N}$.

b. $\alpha_k > 0$ is chosen with a backtracking procedure.

c. $\alpha_k \to 0$ as $k \to \infty$.

[redacted]

Domanda 14
Risposta errata
Punteggio ottenuto 0,00 su 1,00
Contrassegna domanda

Given two random variables X and Y, then:

Scegli un'alternativa:

a. None of the above.

b. $P(X = x|Y) \geq P(X = x)$.

c. $P(X = x|Y) \leq P(X = x)$.

[redacted]

Domanda 15
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

The normal distribution $\mathcal{N}(\mu = \frac{1}{2}, \sigma^2 = 4)$ has the following PDF:

Scegli un'alternativa:

a. $f_X(x) = \frac{1}{\sqrt{2\pi}\exp(-\frac{x^2}{2}})$.

b. $f_X(x) = \frac{1}{2\sqrt{2\pi}\exp(-\frac{(x-\frac{1}{2})^2}{8}})$.

c. $f_X(x) = \frac{1}{\sqrt{4\pi}\exp(-\frac{(x-\frac{1}{2})^2}{8}})$.

[redacted]

Domanda 16
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Given two discrete random variable $X_1 : \Omega \to \mathcal{T}$, $X_2 : \Omega \to \mathcal{T}$ with $\mathcal{T} = \{0, 1\}$, and $f_{X_1} = \{\frac{1}{3}, \frac{2}{3}\}$, $f_{X_2} = \{\frac{2}{3}, \frac{1}{3}\}$ their PMF, then:

Scegli un'alternativa:

a. $\mathbb{E}[X_1] = \mathbb{E}[X_2]$.

b. $\mathbb{E}[X_1] < \mathbb{E}[X_2]$.

c. $\mathbb{E}[X_1] > \mathbb{E}[X_2]$.

[redacted]

Domanda 6
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If

$$A = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 3 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 4 \end{bmatrix}$$

then:

Scegli un'alternativa:

a. $rank(A) = 3.$

b. $rank(A) = 2.$

c. $rank(A) = 4.$

[redacted]

Domanda 7
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $A = U\Sigma V^T$ is the SVD decomposition of an $m \times n$ matrix A, then:

Scegli un'alternativa:

a. None of the above.

b. The elements on the diagonal of Σ are strictly positive.

c. The elements of the diagonal matrix Σ are non-negative.

[redacted]

Domanda 8
Risposta errata
Punteggio ottenuto 0,00 su 1,00
Contrassegna domanda

The solution of $\min_x \|Ax - b\|_2^2$ where A is an $m \times n$ matrix, $m \geq n$, $rank(A) = n$, can be computed as:

Scegli un'alternativa:

a. $A^+x = b.$

b. $x = A^+b.$

c. $AA^Tx = A^Tb.$

[redacted]

Domanda 9
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = x_1x_2$, $g : \mathbb{R} \to \mathbb{R}^2$, $g(t) = (t, t^2)$, then, if $h(t) = f(g(t))$:

Scegli un'alternativa:

a. $h'(t) = 3t^3.$

b. $h'(t) = t^2.$

c. $h'(t) = 3t^2.$

[redacted]

Domanda 10
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = x_1 + 2x_2^2$, $g : \mathbb{R} \to \mathbb{R}^2$, $g(t) = (t, t^2)$ then, if $h(t) = f(g(t))$,

Scegli un'alternativa:

a. $h'(t) = t^3 + t.$

b. $h'(t) = 8t^3 + 1.$

c. $h'(t) = 3t^3 + 1.$

[redacted]

Domanda 11

If $f : \mathbb{R}^n \to \mathbb{R}$, $x^* \in \mathbb{R}^n$ is a strictly local minimum for f if:

16:01 49%

Domanda 1
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $x = 0.7 \cdot 10^{-4}$ and $y = 1.7892$, which is the value of $z = x + y$ when represented in $\mathcal{F}(10, 5, -5, 5)$?

Scegli un'alternativa:

a. None of the above.
b. $0.17899 \cdot 10^{1}$.
c. 0.17899.

[redacted]

Domanda 2
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If A is symmetric and positive definite and $\lambda_1 \geq \lambda_2 \geq \cdots \geq \lambda_n$ are the eigenvalues of A, then:

Scegli un'alternativa:

a. $||A||_2 = \sqrt{\lambda_1}$.
b. $||A||_2 \lambda_1$.
c. $||A^{-1}||_2 = \lambda_n$.

[redacted]

Domanda 3
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

The matrix:

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 6 \end{bmatrix}$$

is:

Scegli un'alternativa:

a. Semi-negative definite.
b. Positive definite.
c. Semi-positive definite.

[redacted]

Domanda 4
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $x = (\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}})$, $y = (-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$, then:

Scegli un'alternativa:

a. None of the above.
b. x and y are orthonormal.
c. x and y are orthogonal.

[redacted]

Domanda 5
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If V is a vector space with $dim(V) = n$, $U \subseteq V$ is a subspace with $dim(U) = k$, then:

Scegli un'alternativa:

a. $U \cup U^{\perp} = U$.
b. $U \cap U^{\perp} = \{0\}$.
c. $U \cap U^{\perp} = \emptyset$.

[redacted]

Domanda 11
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^n \to \mathbb{R}$. Which of the following statements is False?

Scegli un'alternativa:

a. x^* local minimum for $f \implies \nabla f(x^*) = 0$.

b. $\nabla f(x^*) = 0 \implies x^*$ local minimum for f.

c. $\nabla f(x^*) = 0 \implies x^*$ stationary point for f.

[redacted]

Domanda 12
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = 2\sin x_1 + \sin x_1 \cos x_2$, $\nabla f(x_1, x_2) = (2\cos x_1 + \cos x_1 \cos x_2, -\sin x_1 \sin x_2)$ then which of the following is a stationary point for f?

Scegli un'alternativa:

a. $(-\frac{\pi}{2}, 0)$.

b. None of the above.

c. $(0, 0)$.

[redacted]

Domanda 13
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = x_1^2 + \cos(x_2)$, then if the initial guess for a gradient descent iteration is $x^{(0)} = (1, \frac{\pi}{2})^T$ and $\alpha > 0$, then:

Scegli un'alternativa:

a. $x^{(1)} = (1 + 2\alpha, \frac{\pi}{2} + \frac{\pi}{2}\alpha)^T$.

b. $x^{(1)} = (1 - 2\alpha, \frac{\pi}{2} + \alpha)^T$.

c. $x^{(1)} = (1 - 2\alpha, \frac{\pi}{2} + \frac{\pi}{2}\alpha)^T$.

[redacted]

Domanda 14
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Given two random variables X and Y, then:

Scegli un'alternativa:

a. $P(X = x|Y) \leq P(X = x)$.

b. $P(X = x|Y) \geq P(X = x)$.

c. None of the above.

[redacted]

Domanda 15
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

For a random variable $X : \Omega \to \mathcal{T}$, it holds:

Scegli un'alternativa:

a. $Var(X) = \mathbb{E}[X^2] - \mathbb{E}[X]^2$.

b. $Var(X) = \mathbb{E}[X]^2 - \mathbb{E}[X^2]$.

c. $Var(X) = \mathbb{E}[X^2] + \mathbb{E}[X]^2$.

[redacted]

Domanda 16
Risposta corretta
Punteggio ottenuto 1,00 su 1,00

Given two discrete random variable $X_1 : \Omega \to \mathcal{T}$, $X_2 : \Omega \to \mathcal{T}$ with $\mathcal{T} = \{0, 1\}$, and $f_{X_1} = \{\frac{1}{3}, \frac{2}{3}\}$, $f_{X_2} = \{\frac{2}{3}, \frac{1}{3}\}$ their PMF, then:

Scegli un'alternativa:

Domanda **16**
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Given two discrete random variable $X_1 : \Omega \to \mathcal{T}$, $X_2 : \Omega \to \mathcal{T}$ with $\mathcal{T} = \{0, 1\}$, and $f_{X_1} = \{\frac{1}{3}, \frac{2}{3}\}$, $f_{X_2} = \{\frac{2}{3}, \frac{1}{3}\}$ their PMF, then:

Scegli un'alternativa:

a. $\mathbb{E}[X_1] > \mathbb{E}[X_2]$.
b. $\mathbb{E}[X_1] = \mathbb{E}[X_2]$.
c. $\mathbb{E}[X_1] < \mathbb{E}[X_2]$.

[redacted]

Domanda **17**
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If X, Y are multivariate random variables, then:

Scegli un'alternativa:

a. None of the above.
b. $Cov(X, Y) = -\mathbb{E}[X]\mathbb{E}[Y] + \mathbb{E}[X, Y]$.
c. $Cov(X, Y) = \mathbb{E}[X, Y] - \mathbb{E}[X]$.

[redacted]

Domanda **18**
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Given two random variables X and Y, Bayes Theorem implies that $p(y|x) = \frac{p(x|y)p(y)}{p(x)}$ where:

Scegli un'alternativa:

a. $p(x|y)$ is called posterior distribution on y.
b. $p(x|y)$ is called likelihood on y.
c. $p(x|y)$ is called prior distribution on x.

[redacted]

Domanda **19**
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Given two random variables X and Y such that $p(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}x^2}$ and $p(y|x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}(y-ax)^2}$, then the MLE reads:

Scegli un'alternativa:

a. $x^* = \arg\min_x \frac{1}{2}(y - ax)^2 + x^2$.
b. $x^* = \arg\min_x \frac{1}{2}(y - ax)^2 + \frac{1}{2}x^2$.
c. $x^* = \arg\min_x \frac{1}{2}(y - ax)^2$.

[redacted]

Domanda **20**
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Suppose a set of data (x_i, y_i), $i = 1, \dots, N$, $y_i = f(x_i) + \epsilon_i$, where $\epsilon_i \sim \mathcal{N}(0, \sigma^2)$. In linear regression, the likelihood function is:

Scegli un'alternativa:

a. $p(y|x, \theta) = \prod_{i=1}^{N} \mathcal{N}(y|\theta^T x_i^N, \sigma^2)$.
b. $p(y|x, \theta) = \prod_{i=1}^{N} \mathcal{N}(y_i|\theta^T x_i, \sigma^2)$.
c. $p(y|x, \theta) = \prod_{i=1}^{N} \mathcal{N}(x|\theta^T x_i, \sigma^2)$.

[redacted]

Domanda **21**
Risposta corretta

If $f : \mathbb{R}^3 \to \mathbb{R}$, $f(x_1, x_2, x_3) = 2x_2 + x_1 x_3 - 3x_1 x_2$,

Domanda 21

Risposta corretta

Punteggio ottenuto 1,00 su 1,00

Contrassegna domanda

If $f : \mathbb{R}^3 \to \mathbb{R}$, $f(x_1, x_2, x_3) = 2x_2 + x_1x_3 - 3x_1x_2$, $\nabla f(x_1, x_2, x_3) = (x_3 - 3x_2, 2 - 3x_1, x_1)$ then which of the following is a stationary point for f?

Scegli un'alternativa:

a. $(0, 0, 0)$.

b. None of the above.

c. $(0, 2, 0)$.

Domanda 1
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $x = 3.89167$ and $y = 0.4567$, which is the value of $z = x - y$ when represented in $\mathcal{F}(10, 5, -5, 5)$?

Scegli un'alternativa:

a. 3.4343.

b. $0.3434 \cdot 10^0$.

c. 3.434.

[redacted]

Domanda 2
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

A is positive definite if:

Scegli un'alternativa:

a. All its eigenvalues are > 0.

b. All its eigenvalues are ≥ 0.

c. None of the above.

[redacted]

Domanda 3
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

The matrix:

$$A = \begin{bmatrix} 3 & 4 \\ 4 & 9 \end{bmatrix}$$

is:

Scegli un'alternativa:

a. None of the above.

b. Symmetric and positive definite.

c. Symmetric and semi-positive definite.

[redacted]

Domanda 4
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If U is an $n \times n$ orthogonal matrix, $x \in \mathbb{R}^n$, then:

Scegli un'alternativa:

a. $U^T = U$.

b. $||Ux|| = ||x||$.

c. $U^2 = U$.

[redacted]

Domanda 5
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If V is a vector space with $dim(V) = n$, $U \subseteq V$ is a subspace with $dim(U) = k$, then:

Scegli un'alternativa:

a. $dim(U^\perp) = k$.

b. None of the above.

c. $dim(U^\perp) = n - k$.

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Domanda 1
Risposta errata
Punteggio ottenuto 0,00 su 1,00
Contrassegna domanda

The real number $x = 79.5\overline{4}$ in normalized scientific representation is:

Scegli un'alternativa:

a. $fl(x) = 0.7954 \cdot 10^2$.
b. None of the above.
c. $fl(x) = 0.795\overline{4} \cdot 10^2$.

[redacted]

Domanda 2
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Given the matrix:

$$A = \begin{bmatrix} -4 & 0 \\ -1 & -2 \end{bmatrix}$$

Compute the 2-norm and the 1-norm of A:

Scegli un'alternativa:

a. $\|A\|_2 = 6, \|A\|_1 = \sqrt{7}$.
b. None of the above.
c. $\|A\|_2 = 4, \|A\|_1 = 5$.

[redacted]

Domanda 3
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

The matrix:

$$A = \begin{bmatrix} 3 & 4 \\ 4 & 9 \end{bmatrix}$$

is:

Scegli un'alternativa:

a. Symmetric and positive definite.
b. Symmetric and semi-positive definite.
c. None of the above.

[redacted]

Domanda 4
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $x = (3, 1), y = (-3, -1)$, then:

Scegli un'alternativa:

a. x and y are orthogonal.
b. x and y are orthonormal.
c. None of the above.

[redacted]

Domanda 5
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If V is a vector space with $dim(V) = n, U \subseteq V$ is a subspace with $dim(U) = k$, then:

Scegli un'alternativa:

a. $U \cap U^{\perp} = \emptyset$.
b. $U \cap U^{\perp} = \{0\}$.
c. $U \cup U^{\perp} = U$.

[redacted]

Domanda 6
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If

$$A = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 3 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 4 \end{bmatrix}$$

then:

Scegli un'alternativa:

- a. $rank(A) = 4.$
- b. $rank(A) = 2.$
- c. $rank(A) = 3.$

[redacted]

Domanda 7
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $A = U\Sigma V^T$ is the SVD decomposition of an $m \times n$ matrix A, then:

Scegli un'alternativa:

- a. The singular values σ_i of A are $\sigma_i = \sqrt{\lambda_i(A^T A)}$ where $\lambda_i(A^T A)$ are the eigenvalues of $A^T A$.
- b. None of the above
- c. The singular values σ_i of A are $\sigma_i = \lambda_i(A^T A)$ where $\lambda_i(A^T A)$ are the eigenvalues of $A^T A$.

[redacted]

Domanda 8
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

The problem $\min_x \|Ax - b\|_2^2$ where A is an $m \times n$ matrix, $m \geq n$, $rank(A) = k$,

Scegli un'alternativa:

- a. Has a unique solution if and only if $k < n$.
- b. Has a unique solution if and only if $k = n$.
- c. None of the above.

[redacted]

Domanda 9
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x, y) = \sqrt{x^2 - y^2}$, $g : \mathbb{R} \to \mathbb{R}^2$, $g(t) = (e^{2t}, e^{-t})$
then, if $h(t) = f(g(t))$,

Scegli un'alternativa:

- a. $h'(t) = \frac{2e^{4t} - 1}{e^t\sqrt{e^{4t} - 1}}$.
- b. $h'(t) = \frac{2e^{4t} - e^{-2t}}{\sqrt{e^{4t} + e^{-2t}}}$.
- c. $h'(t) = \frac{2e^{4t} + e^{-2t}}{\sqrt{e^{4t} - e^{-2t}}}$.

[redacted]

Domanda 10
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = x_1 + 2x_2^2$, $g : \mathbb{R} \to \mathbb{R}^2$, $g(t) = (t, t^2)$
then, if $h(t) = f(g(t))$,

Scegli un'alternativa:

- a. $h'(t) = t^3 + t.$
- b. $h'(t) = 3t^3 + 1.$
- c. $h'(t) = 8t^3 + 1.$

[redacted]

Domanda 11
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f:\mathbb{R}^n \to \mathbb{R}$, $x^* \in \mathbb{R}^n$ is a stationary point for f:

Scegli un'alternativa:

a. None of the above.

b. if $\nabla f(x^*) < 0$.

c. if $\nabla f(x^*) = 0$.

[redacted]

Domanda 12
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Let $f:\mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = 9x_1x_2^2 - x_1$, $\nabla f(x_1, x_2) = (9x_2^2 - 1, 18x_1x_2)$ then which of the following statements is True?

Scegli un'alternativa:

a. f has 2 stationary points.

b. f has 1 stationary point.

c. f has 0 stationary points.

[redacted]

Domanda 13
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f:\mathbb{R}^n \to \mathbb{R}$, $f \in C^1(\mathbb{R}^n)$, then x^* is said to be a stationary point of f if:

Scegli un'alternativa:

a. The Hessian of f in x^* is positive definite.

b. $\nabla f(x^*) = 0$.

c. x^* is a minimum point of f.

[redacted]

Domanda 14
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If Ω is the sample space, $\mathcal{A}$ is the event space and $\mathcal{T}$ is a subset of $\mathbb{R}$, a random variable X is:

Scegli un'alternativa:

a. A function $X:\Omega \to \mathcal{T}$.

b. A function $X:\mathcal{A} \to \mathcal{T}$.

c. A function $X:\Omega \to \mathcal{A}$.

[redacted]

Domanda 15
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $X:\Omega \to \mathcal{T}$ is a discrete random variable with PMF $f_X:\mathcal{T} \to [0,1]$, then:

Scegli un'alternativa:

a. $\mathbb{E}[X] = \sum_{i\in\mathcal{T}} i$.

b. $\mathbb{E}[X] = \sum_{i\in\mathcal{T}} i f_X(i)$.

c. $\mathbb{E}[X] = \sum_{i\in\mathcal{T}} f_X(i)$.

[redacted]

Domanda 16
Risposta

Given a discrete random variable $X:\Omega \to \mathcal{T}$, with $\mathcal{T} = \{1,2,3\}$, and $f_X = \{$[illegible]$\}$ its PMF, then:

Domanda 16
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Given a discrete random variable $X : \Omega \to \mathcal{T}$, with $\mathcal{T} = \{1, 2, 3\}$, and $f_X = \{\frac{1}{6}, \frac{1}{3}, \frac{1}{2}\}$ its PMF, then:

Scegli un'alternativa:

a. $\mathbb{E}[X] = 6$.
b. $\mathbb{E}[X] = 2$.
c. $\mathbb{E}[X] = \frac{14}{6}$.

[redacted]

Domanda 17
Risposta errata
Punteggio ottenuto 0,00 su 1,00
Contrassegna domanda

If X is a random variable with values in $\mathbb{R}^D$, V_x is the variance of X, then:

Scegli un'alternativa:

a. $V_x[X]$ is a vector $D \times 1$.
b. $V_x[X]$ is a matrix $D \times D$.
c. $V_x[X]$ is a scalar.

[redacted]

Domanda 18
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

The quantity of interest in Bayes' Theorem is:

Scegli un'alternativa:

a. The posterior.
b. The marginal.
c. The likelihood.

[redacted]

Domanda 19
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

Given two random variables X and Y such that $p(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}x^2}$ and $p(y|x) = ce^{-|y-ax|}$, then the MAP reads:

Scegli un'alternativa:

a. $x^* = \arg\min_x |y - ax| + \frac{1}{2}x^2$.
b. $x^* = \arg\min_x \frac{1}{2}(y - ax)^2$.
c. $x^* = \arg\min_x |y - ax|$.

[redacted]

Domanda 20
Risposta errata
Punteggio ottenuto 0,00 su 1,00
Contrassegna domanda

Suppose a set of data (x_i, y_i), $i = 1, \dots, N$, $y_i = f(x_i) + \epsilon_i$, where $\epsilon_i \sim \mathcal{N}(0, \sigma^2)$. In linear regression, the likelihood function is:

Scegli un'alternativa:

a. None of the above.
b. $p(y|x, \theta) = \prod_{i=1}^N \mathcal{N}(x|x_i^T\theta, \sigma^2)$.
c. $p(y|x, \theta) = \prod_{i=1}^N \mathcal{N}(y|x_i^T\theta x_i, \sigma^2)$.

[redacted]

Domanda 21
Risposta non data
Punteggio max.: 1,00
Contrassegna domanda

If $f : \mathbb{R}^3 \to \mathbb{R}$, $f(x_1, x_2, x_3) = x_1^2 - 3x_2^2 x_1 - x_3 x_2$, then $\nabla f(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$ equals to:

Scegli un'alternativa:

a. $(\frac{11}{4}, -1, \frac{1}{2})$.
b. $(\frac{11}{4}, 1, \frac{1}{2})$.
c. $(\frac{11}{4}, \frac{1}{2}, -1)$.

Domanda 6
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If

$$A = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

then:

Scegli un'alternativa:

- a. $rank(A) = 2$.
- b. $rank(A) = 4$.
- c. $rank(A) = 3$.

[redacted]

Domanda 7
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $A = U\Sigma V^T$ is the SVD decomposition of an $m \times n$ matrix A, then:

Scegli un'alternativa:

- a. The columns of U are eigenvectors of AA^T.
- b. The rows of V^T are eigenvectors of AA^T.
- c. None of the above

[redacted]

Domanda 8
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

The problem $\min_x ||Ax - b||_2^2$ where A is an $m \times n$ matrix, $m \geq n$, $rank(A) = k$,

Scegli un'alternativa:

- a. Has infinite solutions.
- b. Has a unique solution if $k = n$.
- c. Has a unique solution for any k.

[redacted]

Domanda 9
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^3 \to \mathbb{R}$, $f(x_1, x_2, x_3) = \sin x_1 - \sin x_2 \cos x_3 + x_3^2$, then $\nabla f(\frac{\pi}{2}, \frac{\pi}{2}, \pi)$ equals to:

Scegli un'alternativa:

- a. $(1, 0, 2\pi)$.
- b. $(0, 0, \pi)$.
- c. $(0, 0, 2\pi)$.

[redacted]

Domanda 10
Risposta corretta
Punteggio ottenuto 1,00 su 1,00
Contrassegna domanda

If $f : \mathbb{R}^2 \to \mathbb{R}$, $f(x_1, x_2) = x_1 x_2$, $g : \mathbb{R} \to \mathbb{R}^2$, $g(t) = (t, t^2)$ then, if $h(t) = f(g(t))$,

Scegli un'alternativa:

- a. $h'(t) = t^2 + 1$.
- b. $h'(t) = 2t^2$.
- c. $h'(t) = 3t^2$. ✓

[redacted]